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Bean Breeders and Women Bean Experts in Rwanda

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BEAN BREEDERS AND WOMEN BEAN EXPERTS IN RWANDA

Consultative Group on
International Agricultural Research

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and Peggy Berkowitz

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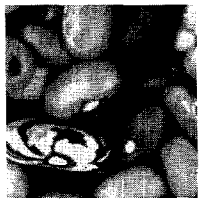
FOREWORD



The CGIAR Gender Program began in 1991 with funding from Ford Foundation, the Netherlands, Canada, Norway, Australia, United Kingdom and United States. Its objectives are to assist the international agricultural research centers (IARCs) in addressing gender issues by (i) strengthening the use of gender analysis in research aimed at technology development and (ii) improving the conditions and mechanisms within the Centers for promoting recruitment, productivity, advancement and retention of highly qualified women scientists and professionals. One of its activities is to make available to scientists and other interested readers materials which further the understanding of gender analysis in research.

The description and discussion of this elegant piece of research conducted by scientists at the Centro Internacional de Agricultura Tropical (CIAT) and the Institut des Sciences Agronomiques du Rwanda (ISAR) is the first of two cases illustrating the impact of and approaches to including women's knowledge and interests in agricultural research. Each case is based on collaborative work done by scientists from an IARC and a national program.

Farming systems and farmer participatory research which adopt a user perspective have enriched agricultural research by focusing scientists, who are developing improved technologies, on their clients—those who will decide whether to use these technologies. Collaboration with farmers in an open and respectful way has given dramatic proof of farmers' knowledge, experimentation and rationality and their value as research partners as well as customers.

Including a gender perspective or gender analysis is now recognized as an important element of the user perspective. In every society there is a division of labor and responsibility by gender. Women and men do different activities including whole enterprises (as in this case of bean production), or specific crop and livestock operations. Their access to resources may vary, as may their benefits from particular production activities. Because of this division of labor and responsibilities, knowing "who" is the farmer and " who does what" ensures that the most knowledgeable farmers and users and those most affected are included as collaborators in the development of technologies. In this case, the "farmer experts" are women who are responsible for most of the bean production in Rwanda.

Acknowledging women's roles is not always easy. We have our own mental blindfolds to recognizing that interests and knowledge may differ within a household. A woman's position in many regions may constrict her mobility, her accessibility, and her willingness to speak in a public forum. As this case illustrates, locally sensitive approaches, respect, and careful listening have high payoff in the delivery and adoption of a set of high performing varieties fitting location-specific microniches and meeting the needs of smallholder bean producers in Rwanda. Support for writing this case has been received from the CGIAR Impact Fund. We are grateful to Louise Sperling and Peggy Berkowitz who have captured the experience of the research for this publication.

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PARTNERS IN SELECTION:

BEAN BREEDERS AND WOMEN BEAN EXPERTS IN RWANDA

INTRODUCTION

Listening to the customer is good business; more and more, researchers are discovering that it's also good science.

In Rwanda, a research team found that combining the different expertise of farmers and breeders early in the breeding process led to better science: faster and cheaper. The breeder-farmer partnership identified many successful options, and more productive options. But it also showed that working with the customer isn't always easy.

It was a well-known problem that spurred researchers to invite women farming experts onto the research station to help select and target bean cultivars: the traditional breeding methods weren't working as well as they should. High-yielding, disease-resistant crop varieties, refined and nurtured by discriminating breeders, were swiftly relegated to family cooking pots—no storage, no reseeding.

And even though the national research system spent the lion's share of its resources on developing new varieties, surveys in 1988 showed that only 10% of bush beans tested on farmers' fields a decade earlier were still being grown, with most on the decline. This rate was modest given that Rwandans sow many, many varieties mixed together and can add another at little cost.

Increasing food production was, and remains, a pressing concern in Rwanda, one of the poorest African countries. Beans, in particular, are key to survival: Rwandans eat more beans than any other people, and depend on them for the bulk of their protein.

In the late 1980s the Centro Internacional de Agricultura Tropical (CIAT), based in Cali, Colombia, and the Institut des Sciences Agronomiques du Rwanda (ISAR), centered in Rubona, began to see exciting results from their introduction of high-yielding climbing beans throughout Rwanda. Scientists felt much of their success stemmed from really listening to farmers, learning how farmers tested and tried new technologies.

But it can be very expensive and time consuming to do "on-farm" testing, that is, working intensively in farmers' fields. "The traditional farming systems approach requires a huge investment by the formal research system in understanding the farmers' conditions," says Douglas Pachico, head of Impact Assessment at CIAT and former head of the Bean Program. "The farmers already understand their conditions! Why can't we use that information in the hands of farmers rather than create a very expensive system to enable us to learn what they already know?"

Was there not a better division of labor to draw on the talents of the scientist and farmer respectively? Breeders have access to exotic genetic material, either from other regions or uniquely created. They also can screen large amounts of germplasm for key stresses, particularly disease-causing agents, which farmers may not be able to see in the seed or plant. Farmers have the edge in much that is local, indigenous to the region or practical. They cultivate in several types of soil, in varying associations and over different seasons. And they know their social or economic constraints. Why not let each partner screen according to his or her comparative advantage?

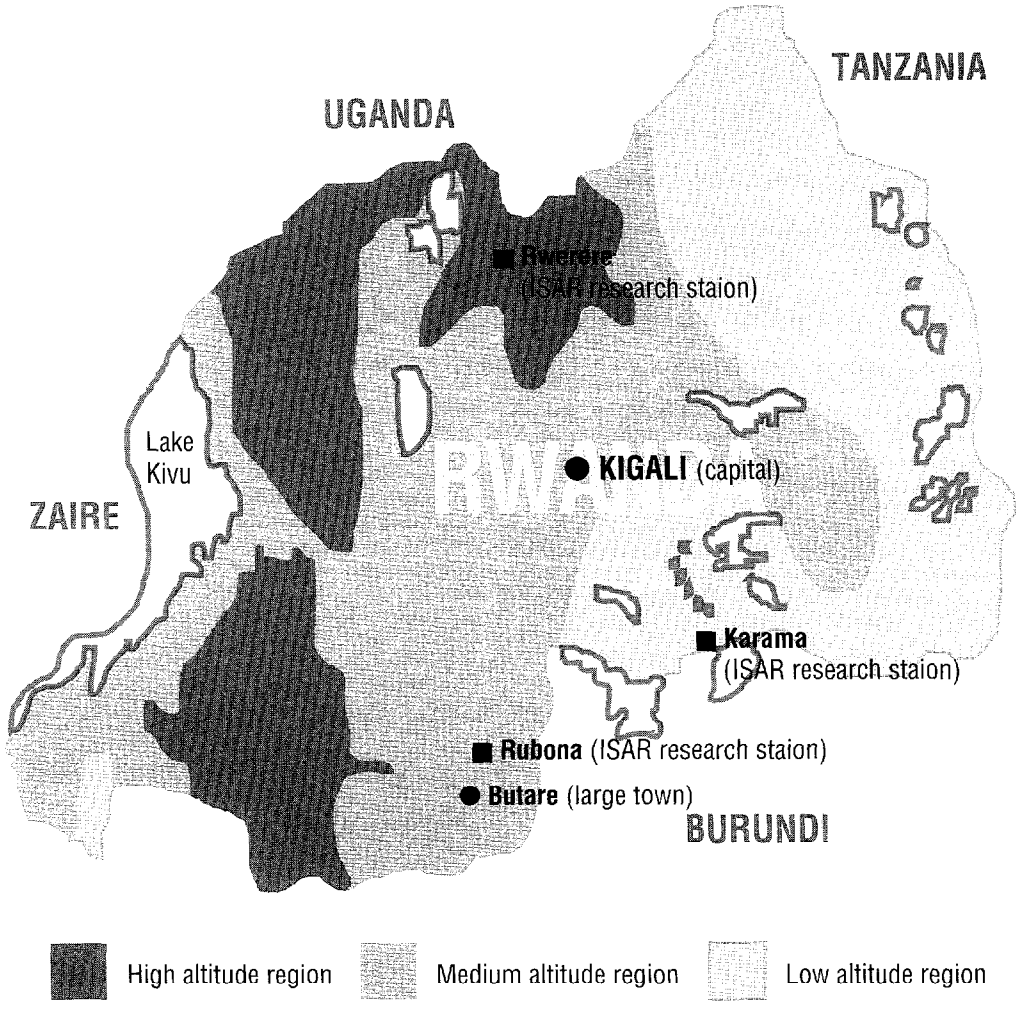
The clincher to the new approach is timing. Cultivars are finished products when they reach household fields. Normally farmers can only manage or contextualize varieties, for example by altering planting dates or variously intercropping. Then their immediate choice is to accept or reject the cultivar. The time to begin this new partnership is when true choice still exists—in "on-station" trials, when researchers under controlled conditions are assessing a range of technical alternatives.

The challenges to integrating farmers into on-station research are enormous. The most gifted have to be identified, methods combining breeder and farmer expertise must be developed, and station trials need to be made understandable to farmers. In Rwanda, an added hurdle loomed over the five-year experiment. It is well-known that Rwandan women take nearly exclusive responsibility for the bean crop: variety seed selection, weeding, sowing, harvesting. It is equally well-known that station researchers are nearly all men. The presence at the research station of women farmers in the role of evaluators has been revolutionary. In a society where women's power derives from their husbands and where farmers are often illiterate, to treat women farmers as experts required a sea change in thinking and behavior from all involved.

The effort has been worth the trouble. The bean varieties selected by farmers have outperformed local varieties with production increases of up to 38%. Breeder selections in the same region have generally given insignificant production gains. And instead of ending up with the one or two varieties normally released, in just four seasons farmer experts identified and adopted 21 promising cultivars, each of them targeted to microniche growing conditions.

THE SETTING: RWANDA

Rwanda is a tiny country—about the size of Switzerland—situated in the region of the Great Lakes of Central Africa. With dormant volcanoes, steep mountain ridges and lush rolling hills descending into dry savannah plains, Rwanda has enough geography and climate to satisfy a much larger expanse.



National indicators suggest how much the country was being stretched, even before the 1994 bloodshed. Rwanda's population exceeded 7.5 million; there were more people per square kilometer here than in any other African country and the average per capita income, about $300 a year, was among the lowest in the world. The majority of Rwandan children under age six suffered chronic malnutrition.

It's isn't easy to farm in Rwanda—but 95% of Rwandans still do. Large families cultivate garden-sized plots, with hoes and small amounts of manure. Beans and bananas are planted together, along with local greens, sweet potato, cassava and trees. A goat here or there drops its needed manure and sale of banana beer helps to scrap in necessities that tilling alone can't cover.

Rwandan farmers in front of their climbing beans, now ready for harvest.

LIVING ON BEANS: THE BUSH VS. CLIMBER DILEMMA

Beans are key to Rwandan nutrition. Most families eat beans once a day—twice, if they can afford it. Beans supply two thirds of their protein and a third of their calories, and Rwandans eat an average of 60 kilos of beans a year, the highest anywhere. They eat every stage of the bean plant: dry grains, green pods and green grains and even the leaves to tide them over the normal October and November famine periods. Bean farmers sow in both the long and short rainy seasons, with more and more trying for a third crop.

Until 10 years ago, beans grown in Rwanda were mainly bush beans, about 30 cm tall. Climbing beans, reaching two meters, had been common only in the higher, fertile region of northwestern Rwanda. Farmers there knew that local climbers could generally yield twice as many beans as bush varieties.

Climbing beans growing on a hillside.

But in other parts of the country, only one in 20 farmers was growing climbers, and then only in small plots. Here, the farmers stressed the disadvantages of climbing beans: their need for stakes, longer maturing time and demand for more fertile soils.

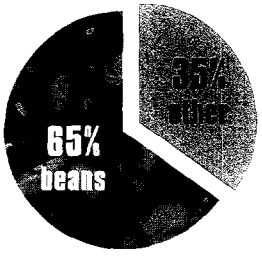
By the mid-1980s, Rwandan farmers were running out of land. With an exploding population, small farms were fragmenting into five, 10 or even 20 parcels. To make matters worse, bush beans were performing under par (about 750 kilos per hectare in good years). A dramatic rise in root rot diseases coupled with declining soil fertility saw bush bean yields tumble 50% from normal yields in both 1989 and 1991.

Landlocked, without important mineral deposits, Rwanda had little choice but to intensify its agriculture and especially to bolster production of its key crops. But how?

It was 1984 when CIAT began working in Rwanda along with ISAR, Rwanda's own agricultural research institute. CIAT, one of 16 international centers sponsored by the Consultative Group on International Agricultural Research (CGIAR), has major research programs on cassava, rice, tropical forages, natural resource management—and beans. About half of its total bean program budget goes to support the African bean networks. The regional initiative, funded by the Swiss Development Cooperation, unites effort of Rwanda, Burundi and Zaire, and goes by the English name, the Great Lakes Bean Improvement Network.

With keen foresight, ISAR's head of the crop department, Pierre Nyabyenda, had recognized the potential of climbing beans in the late 1970s and begun research on several themes. His efforts, supported by CIAT, proved well-timed. By the mid-1980s, a range of improved climbing beans were ready for on-farm testing. Cultivars with Mesoamerican origins from the Mexican highlands seemed best adapted to Rwanda's lower altitudes.

Beans in the Rwandan Diet



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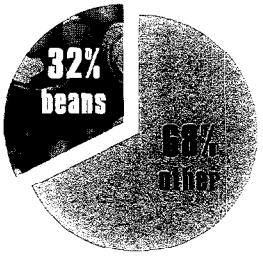

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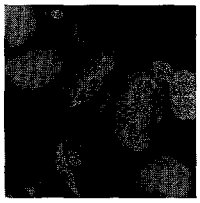


THE INTRODUCTION OF IMPROVED CLIMBING BEANS

Among the more fertile and densely populated parts of Rwanda is the Central Plateau—a misnomer because the region is actually lush hills, divided into small plots, as far as the eye can see. There are few villages to speak of. Instead, mud and wattle houses with red tile or tin sheet roofs pepper the hills.

In the midst of this landscape is Rubona, ISAR's main research station. A sprawl of low, Belgian colonial-style buildings cap the station and staff residences at the top of a hill. Sloping down its three sides are ISAR's carefully terraced fields and test plots.

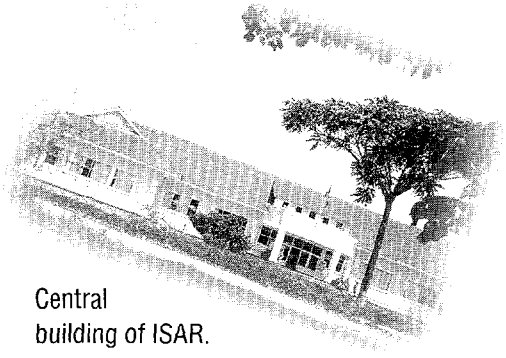
The ISAR/CIAT partnership flourished at Rubona from the mid-1980s onward and was marked by more than a series of varietal releases. To sustain improved climbing beans, researchers also had to address such issues as cost-effective staking materials and improved soil fertility. Farmers, in turn, basically had to learn to manage a new crop. One of their common names for climbers—inyumba or "those from the north"—shows just how foreign these beans were. Some even believed the leaves on climbing beans to be poisonous. Because families depend on foliage during times of food shortage, researchers had to consciously combat this myth.

In the end, farmers were scooping up a popular improved variety whose leaves, they said, were "more delicious than spinach." Researchers baptized it as "umubanomwiza" or "good collaboration"—in tribute to the ISAR/CIAT relationship. One of the local names for it, "Sambumbi" or "grows even on poor soils" suggests its unusual plasticity.

Researchers took an approach unusual at the time—attentive listening to farmers. Their goal was to identify a basket of techniques from which farmers themselves could choose or adapt appropriate climbing bean practices. So, for instance, in southern and central Rwanda, farmers had rarely used staking materials. Through talks with farmers, researchers learned that the labor required for staking might be as serious a constraint as finding the staking materials themselves.

To help develop a range of acceptable technologies, researchers travelled to northern Rwanda, the only area of indigenous climbing beans, and observed how farmers grew hedges of elephant grass to stop erosion and as staking material. The grass hedges were usually planted next to climbing bean fields, which cut the time needed to move stakes. The northern farmers' solution inspired one of several options that researchers eventually offered farmers in the south, ranging from dead stakes of wood to banana fiber trellises to living stakes made when climbers twine their way around field crops such as manioc and maize.

"One of the critical things we did was research how farmers experiment," says Joachim Voss, the anthropologist on the first CIAT team that tried to introduce climbing beans. "Then we designed our project so it corresponded to how farmers experimented."



Central building of ISAR.

The team discovered that a farmer would try new varieties in pure stands, not mixed with other beans, and plant them in the kitchen garden near the house, which has more fertile soil and where she can keep an eye on them. She scatters the seed rather than planting in rows. Once a farmer has tested the variety pure, she tries it on a couple of other fields in mixtures with other bean varieties, to see where it grows best.

"That was their official screening process," says Voss, "So we decided to use the same way of planting and the same locations."

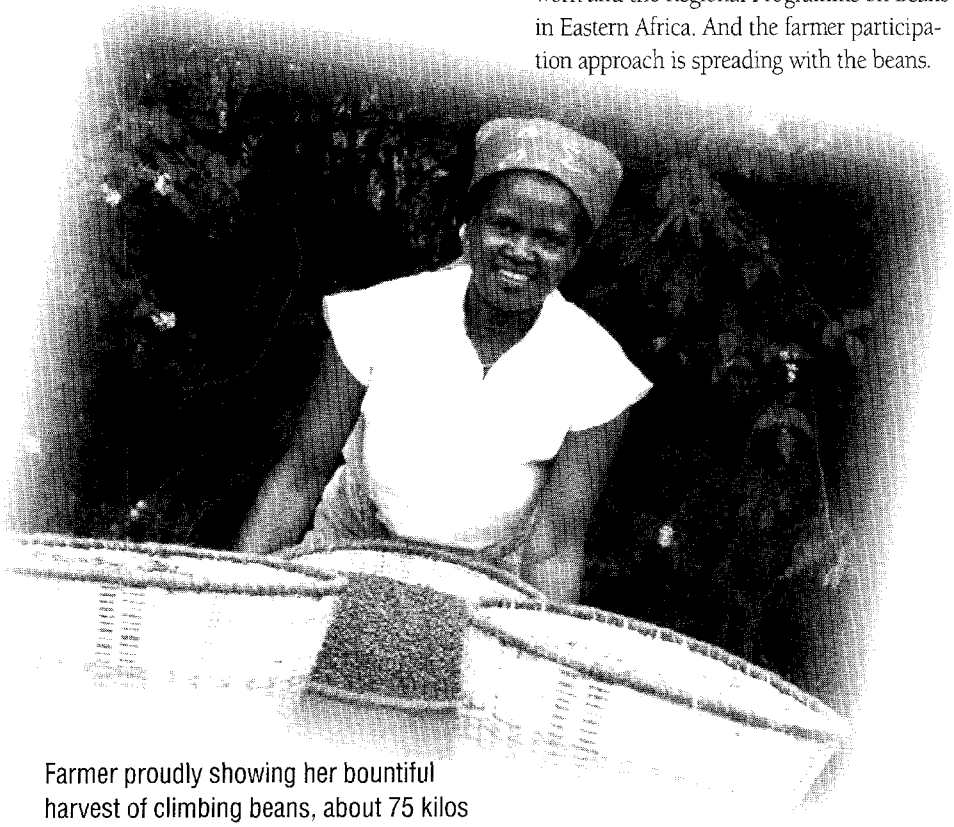
MORE BEANS FOR ALL

By 1992, improved climbing beans had taken off. Four out of 10 farmers were now planting improved climbers—an eightfold increase in eight years, with 500,000 families benefitting.

Analysis of exactly who was adopting brought a number of surprises. While use was relatively high across all farm sizes and wealth classes, it was greatest among those with the smallest holdings (48% of those owning less than a quarter hectare) and lowest incomes (50% of families earning less than US$ 190 per year). So the poorest families were especially prepared to spend the extra capital and labor needed for manure and stakes. Households headed by women were just as apt to plant climbers as male-headed households.

What was in it for the farmers? Most important, lots more beans—three times as many on average soils. (A typical climbing bean plot of about 400 square meters can give roughly 75 kilos, or three baskets, versus the one for bush beans.) Other advantages are more stable production during the heavy rains and more staggered development, which helps families both spread risk and stretch out the fresh food supply. The 1992 production from the two seasons of climbing crops gave farmers 50,000 more tons than the best possible harvest of bush beans, or the equivalent of an extra US$ 12 million in income.

Improved climbing beans are spreading quickly to Burundi, Kenya, Tanzania, Uganda and eastern Zaire, with the help of two bean improvement networks: the Great Lakes network and the Regional Programme on Beans in Eastern Africa. And the farmer participation approach is spreading with the beans.



Farmer proudly showing her bountiful harvest of climbing beans, about 75 kilos from a 0.4-hectare plot (400m^2).

THE COMPLEXITY OF THE BUSH BEAN CROP

There is a richer diversity of beans growing in tiny Rwanda than anywhere else—more than 600 varieties. And while Rwanda is considered a secondary center of diversity (that is not the place of origin), many types are unique, including two of the best nitrogen-fixers found anywhere. Such diversity is only partly the result of natural selection: in addition, generations of farmers have carefully screened generations of beans.

Such a genetic treasure provides the foundation of Rwandan agriculture and, in particular of beans, grown in all major regions of the country from 1000m to 2200m above sea-level. Rwanda's big disparities in rainfall, altitude, soil composition and fertility mean that beans have to thrive in dry, low-lying valleys and in moist, lush volcanic expanses. This also means that beans that grow well in one area may be useless in another.

Obviously farmers in one region sow different varieties from farmers in another. But what particularly surprised researchers was the local variation: one hill or "colline" from another, one neighbor from another, and even variability within a single household's plots. Overall, a farmer might plant 10 to 25 kinds of beans, but the specific mix might change according the immediate soil fertility of a particular 10m by 10m niche. To the untrained eye, it looks as if she takes some kidney beans, white beans, pinto beans, speckled beans and black beans and just throws them together in a bowl—she cooks them that way, too.

Indeed, most Western researchers considered farmers' varieties to be "landraces" and believed the varietal mixtures grown by women were in a state of natural equilibrium, says Voss, the anthropologist. "In fact, most women carefully tailor their varieties to

specific conditions, including soil type, season and associated crops."

Gradually researchers discovered how much targeting and fine-tuning produced this beautiful confetti of grains. And in the early years, researchers frequently lamented how difficult it was to outbeat this local mix. Breeders' own attempts to create artificial mixtures were rejected by farmers as useless altogether.

When asked, 'Why do you plant mixtures?' Immaculé Bapfurera, a farmer, puts forth the common view: "Rains come or don't, soils are good or not—some of the varieties will always produce."

TEAM WORK

Researchers had been learning from farmers across the country's many agroecological zones: they knew that farmers experimented extensively, that they grew mixtures because some beans would always produce. But the learning process was long and expensive.

Further, while farmers had started to evaluate varieties tested on-farm in the 1980s, the process had been only partially effective in bringing the farmers' voice into the breeding process. Researchers learned that farmers had a range of criteria they considered important when evaluating varieties. Eventually some 15 basic characteristics were listed, some major, some secondary.

"We knew that different user groups weigh the aspects differently," says anthropologist Louise Sperling, who spearheaded the CIAT team project to bring farmers onto the research station. "So for instance, the poorer generally prefer shorter-cycle cultivars. But it was quite a challenge to anticipate how farmers in different regions and wealth classes would balance these desired characteristics—the trade-offs between earliness and yield, or grain size and taste."

Rwandan women farmers.

This massive data collection tendency is common when national research programs work with farmers. The logic goes: researchers have to ask different client groups what they like and don't like. Then researchers synthesize the information and offer solutions.

But in the case of varieties, should breeders screen for all critical characteristics? How efficient is the process? And how accurate is the information "extracted" from farmers?

Another possibility would be to bring farmers into the research process earlier, rather than waiting for on-farm trials of new varieties, five or more years into the breeding process. "We thought it would be an effective way to both speed up and improve the utility of the whole process of making new germplasm available to farmers," says Pachico, who then headed CIAT's Bean Program. "Farmers have a much better appreciation of their growing conditions and their objectives and the way they want to integrate germplasm into their farming systems. This is all very complex."

So complex, in fact, that researchers are at a big disadvantage. "Be they breeders or agronomists or economists, they don't have that information at their finger tips," he adds.

Excellent results had already been seen in Colombia from bringing farmers into the breeding process at an earlier stage. Jacqueline Ashby, a sociologist then working for the International Fertilizer Development Center, had begun in 1985 building up groups of farmers in local communities in the Andean region, showing them bean genetic material at very early stages of its development. The farmer feedback prompted breeders to put together a large nursery of more than 100 types of genetic materials corresponding to what farmers said they were interested in. Farmer selections from the nursery were then crossed with the farmers' own varieties, or landraces.

"We completely turned (the breeding process) on its head and said, 'In the early stages is when you get feedback from farmers on what their preferences are,' "explains Ashby, now leader of CIAT's AgroEcosystem Program. "That was a very different approach from what had been seen as the role of farmers."

In 1988, Sperling suggested bringing farmer representatives onto the research station in Rubona. "Louise's contribution was to say, 'Look, maybe rather than bringing 40 varieties out to the community, it might be cheaper to bring the communities onto the station'," recalls Pachico.

To even begin to think about such a method, says Pachico, a team approach is crucial. "You cannot really expect our breeders to become responsible for identifying knowledgeable farmers and bringing farmers onto the station. They're trained in genetics."

Fortunately, CIAT in Rwanda has always worked in teams: an agronomist, breeder, pathologist, anthropologist and early on, even a nutritionist. Also key, a farmer-oriented perspective has cross-cut the disciplines: "This participatory approach is something that is imbued in the whole of the CIAT team," says Roger Kirkby from Dar es Salaam, Tanzania, where he coordinates CIAT's bean program for all of Africa.

THE TYPICAL BREEDING FORMAT

It may sound like a logical progression, but bringing farmers on station to evaluate genetic material represents a radical break from the normal breeding process.

The typical western-inspired breeding format is a lengthy process of breeding various "lines" or genetic material which are winnowed down each season to eliminate those that perform under par—under par, that is, for controlled station conditions. It often takes five to seven years to come up with a variety that can be tested on selected farms. Farmer feedback is sought at the very end of the process, if at all.

The focus is on a limited set of high-yielding varieties, that are widely adaptable for large zones; maybe for a small country, or areas of several countries.

"That's how it's done in the developed world," observes Urs Scheidegger, an agronomist who joined the program in 1989. "The big seed companies don't want to deal with 20 varieties, each for a narrow agroecological niche. Even one variety a year is a lot."

But this format poses problems for regions or countries of immense climactic and geographical variety, such as Rwanda and the entire Great Lakes region.

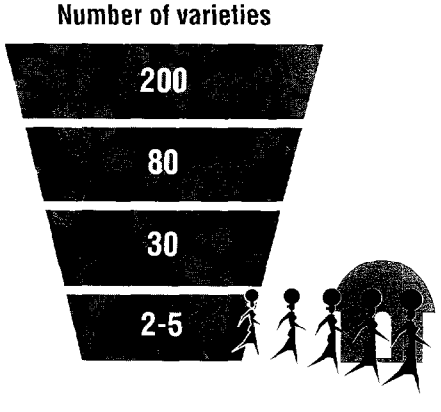
It is perhaps a case of missed opportunities or untapped potential. The typical breeding format seeks a high-yielding superbean and ignores the farmers' complex planting conditions as well as local expertise. What are needed are beans targeted for a wide range of ecological and socioeconomic conditions. "Maybe the breeding program was not aggressive enough in releasing as many varieties as they could have," muses Scheidegger.

By the time he arrived in Rwanda, women farmer experts had been invited on station for a couple of seasons. They were planting some promising varieties that, Scheidegger says, would never have made it through the official breeding selections—a situation not unique to Rwanda.

"It's a general phenomenon I've seen before with other crops as well, especially potatoes. Many varieties now in use by farmers came from national programs and were eliminated at some stage in the breeding process, yet farmers picked them up or stole them and now they're the most important ones. Cases are documented like that in Peru, Kenya and so on."

Formal selection format

In on-farm trials, farmers test a set of varieties chosen by ISAR breeders.



WOMEN'S ROLE IN RWANDA AGRICULTURE

To bring farmers into the breeding process earlier meant, first of all, identifying the right farmers. In Rwanda, all able women in a household take part in farming. Women are responsible for feeding the family; they do much of the heavy farming labor. And the bean crop is basically a women's crop.

"There was never any question of the general pool of farmers from which to search for expert representatives—women," says Sperling. She recalls one occasion when it seemed a bout of malaria might keep Veneranda Mukondoli, a farmer expert, from travelling to the ISAR research station to evaluate bean varieties. When her husband suggested that he go in her place, Veneranda responded with a smile: "You must be kidding, I'll send our young daughter first. What do you know about beans?"

But women farmers wouldn't be the "right experts" to evaluate every crop variety, stresses Sperling. Rwandan men would likely be more skilled at screening banana stands, certain cash crops such as coffee, and many commercially-used trees.

Marie-Jeanne Uwera, a Rwandan agronomist who worked in the farming systems department of ISAR, the sole female scientist of 54 ISAR researchers, explains further: "Most farm activities are run by women from seed selection to harvest. But that changes when there's profit involved. Then the men are more interested. But the money they earn won't be invested to buy seeds. The men drink alcohol and the women have the same problems as before."

To make matters more difficult, women don't have the right to inherit land. If a woman divorces her husband, she returns to her birth family and becomes her brothers' responsibility. "She goes back (home) with her children, and they won't have a right to the land either," says Uwera.

Women are at the bottom of the heap in Rwanda's extremely hierarchical power structure. A woman's power derives from her husband—or father or brother or lover, as the case may be. "Women have no race," goes one Rwandan proverb—they adopt their husbands' race.

"It's really too bad, eh? The women are not well off in my country," observes Uwera.

Despite her lack of power, the woman's capacity to put food on the table is decisive for her family's well-being. "To be richer than your neighbor depends on your wife," goes another Rwandan proverb.

Woman with a hoe preparing a field.

FARMERS AS EXPERIMENTERS

CIAT and ISAR had good insights from both the climbing bean research and mixture studies that farmers experimented fairly regularly. With time, however, they began to realize just how widespread the testing was, and how many methods of experimenting there could be.

Farmers themselves explained: "Turi abashakashatsi (We are researchers)," said Concessa Kankindi, displaying the plot right outside the bamboo gate of her family compound. "We plant small quantities in different ways and look at the results. Then we mix or don't mix."

Given a handful of seeds, Kankindi tries a portion in pure form and a portion in her own varietal mixture, to look at how aggressively it competes in a mix. Odette Nyiramisago usually divides the new seeds in two and tests the samples on less fertile and more fertile soils. Some farmers test a variety by planting it, both under and away from banana stands. Others experiment with sowing density, and still others compare scattering the seeds (or "broadcasting") to sowing them in lines.

"Almost all the farmers I met plant variety samples for at least two seasons before making any evaluation at all," says Sperling, who interviewed more than 800 farmers during her five years in Rwanda.

Godelieve with her own experimentation plot. Bananas in the background.

THE TRICKY JOB OF IDENTIFYING EXPERTS

Although most expertise about beans rests with Rwandan women, it became clear to the research team that not all women were equally expert.

"You realized quite quickly that there are farmers who are very interested in varieties, and who talk about them in what we would consider technical terms, and others who are much more vague," explains Sperling. And there are also farmers who have results, when others don't.

The problem was trying to translate this western notion of "expertise" into terms the community would understand. "When we first tried to talk to communities, they always pointed to progressive farmers, the richer farmers. The extension system had long passed the message that only those who used purchased inputs like fertilizers or modern cultural techniques like sowing in straight rows were truly leading farmers. It took a lot of time to talk to women about farmers who

Farmer Expert with her family. (Agnes is a particularly poor farmer. The thatched, round hut gives this clear signal - yet she was an eager experimenter.)

knew how to help varieties grow even in stressful conditions."

Veneranda Mukondoli was the kind of experimental farmer the team was seeking. Born in Save, less than 20 km from her current home, she hadn't travelled much and never to the capital Kigali, some 100 km away. She had given birth to 12 children, six of whom died young. Her family is of modest means: a small house with a sheet metal roof, a few pigs, no cows. Nothing would immediately distinguish her from other women farmers, but her farming knowledge is respected by the community, at least the female community.

A "community" could be a women's group or a neighborhood association. Unlike many areas in Africa, however, farmers in Rwanda tend not to organize. In finding community representatives, researchers often had to work through the government administrative unit called a "colline" that encompassed 200 to 500 families on a hillside.

Age was important, too. A newly wed wouldn't be seen to have enough farming experience, while an old woman could be considered senile. Usually communities nominated women with some 15 to 25 years' of farming experience.

"We never felt we had all the right experts and we were continually rotating," says Sperling. Over four growing seasons, 310 evaluations were obtained from 90 different farmers in three agroecological zones, a small number of whom screened for all four seasons. Identifying experts, says Sperling, "is a very tricky thing to do and I would never underrate how difficult it is."

After hearing from community groups, researchers visited the fields of the women nominated to take part in the evaluations. At a quick glance, the garden plot of a recognized, knowledgeable farmer might not look very different from her neighbor's. It would be intercropped, with the seeds broadcast rather than sown in lines, and fairly well tended according to local practices—not all tangled up with weeds. "But you wouldn't walk through and see a model farm, not at all," says Sperling. "What's different is her idea of conscious experimentation."

In addition, researchers sought out women who were thoughtful, articulate and who didn't appear to be intimidated by men. That was crucial in an environment where the majority of scientists had never been conditioned to consider farmers as experts or women as thinkers.

"Finally, if the candidate expressed a strong interest we took the final step—getting permission from her husband," says Sperling. In several cases, husbands forbade their wives from taking part in the on-station trial evaluations, perhaps out of jealousy, perhaps for fear of giving her too much freedom.

BATTLING FEMALE STEREOTYPES

Though it was patently obvious that women were the leading bean farmers, it was crucial for the team to specify it was working only with women. "Otherwise, you'll always have men around, and even one or two can disturb the process a lot," observes Scheidegger, the agronomist. "The pioneering thing was that (Sperling) concentrated on women, she said she was working only and exclusively with women." (In fact, one participant was a single elderly man whose wife had been chronically sick for years; unusually, he took care of the beans and household chores.)

ISAR's farming systems department also tried bringing farmers on-station to meet breeders, with both men and women farmers attending. But Uwera, the female ISAR agronomist, says, "Rwandan women won't talk in public if there are men there, even if they have the information.

"After the meetings we asked the women, 'Why didn't you talk?' and they said that it isn't good to show yourself in public, you'll have problems with your family and your husband may say you're arrogant."

In one case, a group of farmer-experts from the highland station of Rwerere were characterized as lazy and disrespectful when they first took part in the on-station evaluations.

"At the beginning, our neighbors made fun of us," these farmers told research assistant Beatrice Ntabomvura. "They said we were not wise, we were not disciplined, we didn't want to work, we didn't respect our husbands, we were cantankerous. Our neighbors weren't interested in what we were doing on-station. They just scorned us."

But after a few visits to the station, their image in the community improved. The varieties the

farmer-experts selected were particularly of interest. "Now they are very curious about what we are doing. They always ask us what happened upon our return. They wonder how things work on-station. Can they come too?"

EXPLORING FARMER EXPERTISE ON-STATION

The farmer experts were invited in groups of 10 to 20 to the research station in their region: the high altitude station (2300m above sea level) at Rwerere, the mid-altitude (1650m) at Rubona or the low altitude (1400m) at Karama.

On the day of evaluations at Rubona, the women were picked up in jeeps at a central meeting place near their homes. "It was an exciting, almost festive kind of occasion. The women were always very nicely dressed, with babies ever in tow. I sensed a blend of nervousness and pride," recalls Sperling.

"The first time, we walked them around the research station," she continues. "Although they lived only 15 to 30 kilometers away, they'd never been on station. We showed them seed storage facilities, research offices, other crops in the field. ISAR had a new way of propagating sweet potatoes which they found very exciting. They asked lots of questions, such as, 'Why are you sowing in lines?' And they soon warmed up, giving good-humored but honest critiques, like, 'You're wasting a lot of space with such planting densities'."

Then the farmers and scientists met together, and each group was asked to explain their expectations of the trials. For example, farmers often wondered if they had to plant these varieties. But these were not classic field days, where farmers are shown the varieties on offer, as a kind of pre-extension tool. Rather, experienced farmers would be asked to assess 15 bean varieties in the final stage of on-station testing, one to four seasons before the normal start of testing on-farm. These evaluations were critical for research itself.

"We explained that these would be varieties they had never seen before, even though they might look like local varieties," says Sperling. "And we tried to anticipate and eliminate other biases which might falsely skew farmer perceptions."

The on-station experimental designs were unfamiliar to the farmers, so the breeders explained the logic of their layouts, such as uniform planting densities and the use of replicates to ensure reliability of results. In these trials, 15 varieties were sown, usually two lines each, in four to six plots (or replicates). Farmers evaluated varieties on one plot only. Breeders also discussed their use of manure and other practices that may have improved the yield.

"It was my job to set up the trials on the station in such a way that the farmers could view them," explains Jeremy Davis, the CIAT plant breeder who now works for a commercial plant breeding concern in Cambridge, UK. "We laid out the plots with sufficient space around them so that people could comfortably come and look at them, and we labelled them and put seed samples alongside the plots."

Although they knew farmers planted beans with other crops, researchers made a deliberate decision not to intercrop the varieties in the experiment. "Farmers themselves plant varieties pure when testing. And we didn't want to, as it were, prejudice their judgment by putting them under any particular circumstance other than just in open fields," explains Davis.

Another challenge was training researchers to interview farmers in a way which gave them free rein and encouraged them to share insights.

"Many of them had never interviewed farmers in a way to hear their point of view," says Sperling. "They'd talked to farmers in terms of extending technology—*do this, do that*. But how to bridge the gender barriers, how to ask open-ended questions, to probe, to listen—it wasn't something that scientists are trained to do."

At the beginning, several farmers complained in private that the interviewer didn't listen. "He didn't care or write down what I said," a participant remarked after her meeting with a scientist. Such was the seriousness of their commitment that one slighted group had a post-evaluation meeting in the privacy of their home courtyards. They forwarded additional comments via a trusted technician, Ntabomvura.

Immaculé Bapfurera evaluating on-station bean trials. She is taking notes - to help her memory and report back to community members.

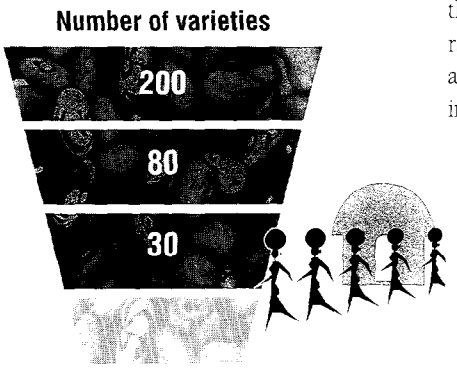
Female Rwandan technicians were crucial to the success of the experiment at the beginning stages, easing discussions between researchers and farmers and translating Kinyarwanda, the local language, for western researchers. Those scientists, Rwandan or otherwise, who felt really uncomfortable talking to farmers never had to.

The farmers who took part appreciated their visits to the station. They were grateful for the chance to learn something in advance about bean varieties, instead of being expected to plant the seeds blind. They also respected the concept of choice, being able to screen a range of cultivars, and having the option to say "no".

An unforeseen benefit for the farmers was being able to talk with other knowledgeable farmers, many of them from different parts of the region. "We especially enjoy the chance to discuss the various varieties among ourselves, to exchange ideas," said one woman.

Participatory selection format, phase 1

Farmer experts evaluate on-station trials at multilocation stage; they select varieties for testing on their home plots.



What if the farmers make mistakes?

Unless the questions were clear and the evaluations easy to perform, the information collected from the farmers might be muddled or just plain wrong. Here, team work played an important role. With biological and social scientists working together, the chances of getting relevant data were much higher than if the breeder, say, or the anthropologist had set up the experiment alone.

The farmers had targeted two crucial stages for judging the plants: at the flowering or pod formation stage, and at maturity. At each stage, they were asked to rate the varieties on a scale of one to five (where one was "poor" and five was "excellent"). As a cross-check, farmers also picked the "three best" and "three worst" cultivars. Near the end of the evaluation, they could select two or three varieties to take home for testing. An open format gave farmers the chance to evaluate the beans according to their own criteria. Each criterion, either positive or negative, was carefully recorded in the farmer's own words. But it also gave breeders the kind of precise information on which they felt comfortable taking action.

In effect, farmers were being treated as researchers and also as well-informed customers, with a right to choose the technologies they thought would perform best. This was a radical change from handing farmers pre-approved seeds; it required just as big a shift in the beliefs of the scientists.

Julia Kornegay, who heads CIAT's Bean Program, says, "In that sense it was like a revolution and an awakening, that there is a potential interaction there that should be exploited. And like anything new, there were people deadset against it and others that were completely pro-change."

Certainly breeders have expressed varied stances in the face of such a researcher-client partnership. Some seem to resist the experiment because they fear they will lose control of the breeding program. Under the usual breeding process, plant breeders can claim authorship of a plant variety they've developed. But extensive collaboration with farmers might make it more difficult for a breeder to claim it was "his" or "her" bean plant.

"Frankly, plant breeders initially feel threatened by this," observes Pachico of CIAT. At first, he says, they're afraid that their expertise is being replaced by farmers' expertise. Breeders, like many highly skilled researchers, like to have the sense that they have the right answer. "But then," he adds, "they begin to see that by having greater farmer participation, farmers begin to use more of their product than they used to."

And there are those like Nyabyenda, the senior breeder and head of ISAR's crop department, who are concerned that farmers might "make a mistake". He worried that farmers might choose varieties that were unacceptable or disease-ridden. Wouldn't it be best, he wondered, if farmers collectively chose five varieties—that is, that they not have the full leeway to target for their own plots?

It is hard to gauge whether such stances of "threatened ownership" or "benign paternalism" are more firmly held because the Rwandan experts were women, or poor, or both. Says Sperling, "We only know that such concerns do exist and that the issues will have be resolved if such client-researcher partnerships are to expand."

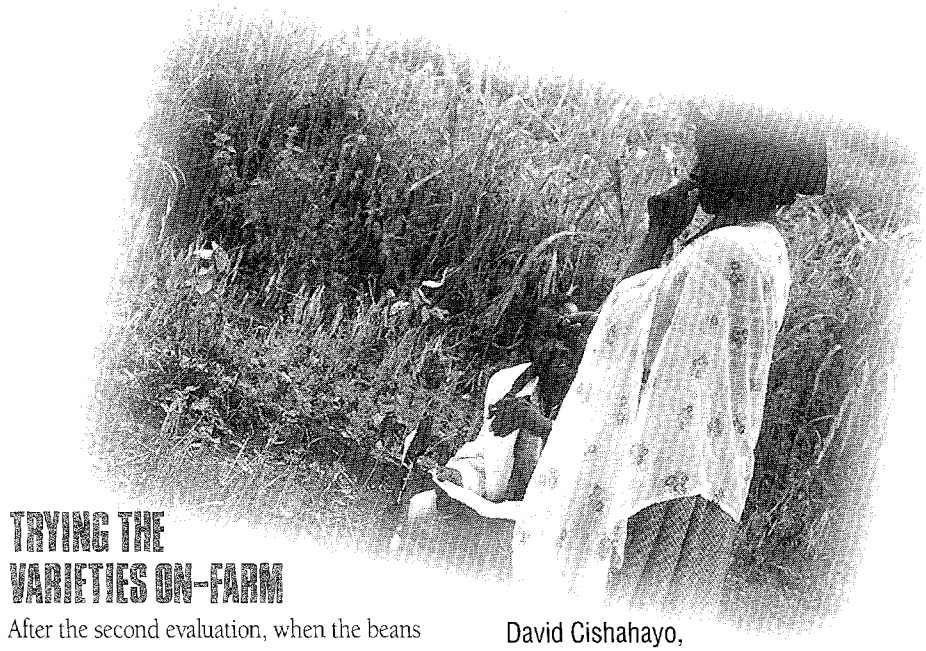
Among the three Rwandan and two expatriate breeders involved in the fieldwork at Rubona, there were several who, from the start, felt farmer input would help them make better decisions.

"I am learning new criteria," said David Cishahayo, the breeder-agronomist at the lowland station of Karama. "I never knew about the importance of resistance to wind. And we certainly should learn more about which qualities make leaves more and less edible."

Said another, "I don't always agree with their choices, but the women are encouraging me to consider a broader range of concerns."

CIAT team members praise ISAR for having the courage to explore alternative research methods, especially when the new methods shook established beliefs and when so much was at stake for the breeders. Nyabyenda, despite his own reservations, fiercely defended this participatory research program at regional meetings of the Great Lakes network. The project never suffered budget cuts and was generally given free rein to expand. "It would have been so easy for him to say 'No'," reflects Sperling. "And instead, he rather put out a challenge: 'You have yet to convince me—but try'."

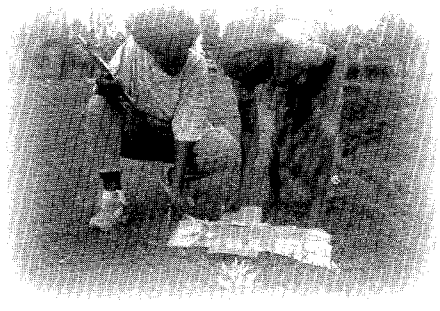
Beatrice Ntabomvura doing follow-up studies with Febronie Uwimana to see which varieties she is still using.



TRYING THE VARIETIES ON-FARM

After the second evaluation, when the beans were at full maturity, the women took home seeds of the two or three varieties each had personally selected. The farmers were asked to choose just two or three varieties at a time because "we wanted to make sure the seeds would be planted," explains Sperling. "They had very small bean plots and might only be able to test a couple at a time. But we also had the normal multiplication shortages: not a great deal of extra seed."

The farmers were asked to test the varieties according to their usual local methods: manure, soil type, planting densities were left to their own choosing. The only requirement was for a physical, local "check" to be placed in an adjacent plot and planted under the same farmer-designed experimental conditions. While comparing a new variety with a control is second nature to Rwandan farmers, some of them "carry the check in their heads"—that is, they know how the plot should yield under given conditions.



David Cishahayo, the agronomist/breeder at the lowland station, is crouched, eagerly listening to a farmer and taking notes.

But for the purposes of the ISAR experiment, which was still exploratory, researchers wanted more tangible data.

Davis, the plant breeder, says that because the women felt more involved in the process than they ever had before, they took more care with the experiments than in previous on-farm trials.

"In standard on-farm trials, the seeds tended to get stuck onto the corner of the worst field," recalls Davis. "This way, because they were involved, they tended to give the trial on their own field more attention."

It was expected, and frequently discussed, that the farmer experts, being somewhat privileged by station visits, were expected to share the seeds that performed well with their neighbors. But in the highly individualistic Rwandan society, the sharing of seeds didn't work as well as researchers had hoped. "We were somewhat disappointed in terms of how little they passed on varieties," concedes Sperling. "It wasn't as collegial as I've seen in other rural communities, even those equally on the margin."

On-station results

The on-station evaluations gave insight into the varietal criteria farmers consider important. While observed yield is important, many other characteristics figure prominently. Some varieties farmers selected for home testing had among the higher on-station yields, but a good number were also in the middle ranges.

"It seems as if farmers are looking for two basic types of traits," says Sperling. The first type are those breeders are most familiar with: preferences, or aspects of the plant that are valued, such as early maturity. Less important to these subsistence-oriented Rwandans are grain color and shape because "they consume much of their harvest and Rwandan townspeople buy mixtures anyway," adds Sperling.

Second, farmers judge varieties according to their expected performance in diverse home conditions: planted on intercropped fields, on poorer soils, or under dense banana stands—in general, stresses likely to be encountered on their own farms.

Scheidegger, the team coordinator, explains that farmers extrapolate performance from specific traits. For example, varieties with sturdy stems and the lowest pods not touching the ground are considered less prone to pod diseases. "These performance variables are at least as important as the more traditional customer preferences" such as maturity and taste, says Scheidegger.

Despite the fact that farmers were targeting for their own home conditions, statistical tests showed that the farmer evaluations were not random. Across the three regions, there was broad agreement on which varieties were the "winners" or "losers". But there was a greater degree of accord at any one station than across the three stations at high, medium and low altitudes. This is not surprising: farmers sowing at 1400m in drought conditions have different concerns than their peers trying to combat moist and mountainous areas at over 2000m. Even within a region, however, there was variability among farmers, as one would expect with heterogeneous planting needs.

"Part of the interesting thing about the study was that farmers appeared able, by looking at a plant, to say, 'Hey that variety would do well under bananas' or 'Hey, that variety would do well on poor soil'," says Davis.

Many scientists involved in the farmer evaluations on-station were prepared to consider them accurate. Farmer evaluators had been selected with care, an evaluation methodology had been refined and double-checked: so, perhaps farmers can project from on-station trials to actual planting conditions. On the other hand, high agreement scores could be the result of farmers sharing similar (and possibly erroneous) myths. Are farmer evaluations simply hot air? For all concerned, the critical test lay in production results: how the farmer-selected varieties performed on-farm.

Most frequently cited positive attributes of varieties in on station breeding trials evaluated by 78 farmers at Rubona station 1988-1990

Attribute	Frequency % among All varieties (N=1072)[t]	Frequency % among Varieties chosen for home testing (N=198)
High yield	44	68***
Perform well under bananas	28	41***
Perform well under adverse conditions		
on poorer soils	13	29***
in heavy rain	32	46***
in drought	11	12[ns]
Early maturing	23	38***
Nice grain colour	13	16[ns]

[t] Evaluation of individual varieties
*** Frequencies differ at p<.001
[ns] Not signifigant

Performance on-farm of varieties selected from on-station trials by Rwandan farmers vs. those selected by breeders

Season	Number of trials	Trials where new variety outperformed local mixture (%)	Yield increase of new variety over local mixture (%)
Farmer selection – Central plateau			
1989A	11	73^{ns}	3.9^{ns}
1989B	19	89**	33.4**
1990A	36	64^{ns}	12.9^{ns}
1990B	18	83**	38.0*
Breeder selection – Central plateau			
1987A	32	34^{ns}	-8.8^{ns}
1988A	45	49^{ns}	-18.9^{ns}
1988B	15	53^{ns}	0.7^{ns}
Breeder selection – Countrywide			
1987A	131	51^{ns}	6.7*
1987B	83	41^{ns}	-6.0^{ns}
1988A	204	50^{ns}	2.6^{ns}
1988B	204	50^{ns}	7.6*

^{ns} Not signifigant
* $P < 0.05$
** $P < 0.01$

YIELDS ON-FARM

Even after just one season, "The result was quite stunning," says Davis. "Something like 75% of the varieties these people took home they ended up growing as well the next season. We had enough time to get a feel for the fact that it seemed to be working."

Yield figures over four seasons bore the CIAT breeder out. In the Central Plateau, not far from Rubona, bush varieties selected by farmers over four seasons of trials performed better than their own local mixtures 64-89% of the time. Their selections also produced substantially more beans, with average production increases as high as 38%.

Direct comparison with breeder selections was impossible in the exact same locale over the exact same seasons—precisely because development projects, the usual on-farm collaborators, had refused to take part in any more ISAR trials: "ISAR bush varieties just don't yield, we've had enough," were the kind of views heard from more than one project director.

Data from the four previous seasons—the period of most ISAR on-farm testing—confirmed those views: breeder-selected cultivars outperformed local mixtures in 34-53% of the trials in the Central Plateau region, but with insignificant production increases.

Countrywide, the results were slightly better—breeder selections in the same years yielded more beans than local mixtures in 41-51% of on-farm trials, with 8% being the highest average production increase. But they still didn't come close to the farmers' selections.

"Even though the farmers' selections had to satisfy a range of other criteria, they still beat the breeders' with respect to yield," says Scheidegger.

"Sometimes when I present this material," says Sperling, "enthusiasts jump up from the audience with an attitude of 'We told you so—farmers are better than breeders.' But I think they have distorted the point. The work in Rwanda suggests that expert farmers were better than breeders at targeting beans for their local conditions. And they should be. Breeders can't possibly anticipate all of farmers' farming and economic needs. But the challenge is to make sure that farmers are given the room to do what they do best—leaving breeders to focus on their own strengths."

How durable were these farmer-selection results from season to season? Follow-up studies, up to nine seasons later, showed that varieties chosen by farmers had a greater chance of being grown for several seasons than those chosen by breeders. Indeed, the 21 cultivars selected by women evaluators to fill many microniches had on average a 71% chance of being grown six seasons later. This compared with a 61% chance for the single most popular bush bean ISAR had previously released.

"These are both good rates," says Sperling. "The difference is that women had selected 21 varieties with a good chance of being adopted, versus the one for ISAR."

Moreover, most new varieties had been successfully integrated into the farmers' own bean mixtures. They were complementing rather competing with farmers' propensity to mix for production success.

RESEARCH DIVISION OF LABOR

Perhaps the most important lesson was realizing that farmers used a wider range of criteria than breeders did for selecting varieties. Observed yield is important for farmers, but so is a variety's compatibility growing with bananas and its tolerance to rain. Furthermore, the criteria farmers used and their relative importance varied by region.

"It's impossible to have breeders selecting for these traits," concludes Scheidegger. Instead, he says, breeders should concentrate on technical areas where they have specialized knowledge, such as breeding resistance to pathogens and disease. "The whole idea is that you have a division of responsibility and labor between the breeders and the farmer."

As Pachico of CIAT says, "The breeders' real expertise lies in their capacity to generate new genetic variability. The farmers can't do that, or they do it at an extremely slow rate. Scientific breeding can really accelerate the process and that's where breeders have something nobody else has."

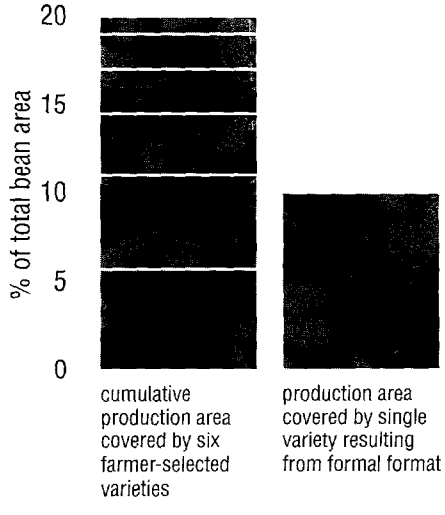
What can farmers do best? "Target," says Sperling. "Target for their local agroecological conditions. Target for socioeconomic needs."

CHANGES AT ISAR

The experiment showed the utility of releasing a range of varieties for different niches, especially for crops like beans that grow in diverse environments—getting away from what anthropologist Voss terms "the breeders' holy grail of the supervariety."

Releasing more well-targeted varieties means greater production stability, but it also means production impact. An important measure of production impact is the amount of area planted to new varieties. "In a diverse environment such as Rwanda, a breeder's dream variety might eventually cover 10% or, at most 15% of the bean production area," says Sperling. "By comparison, those high-performing niche varieties, say six of them, might cover respectively 1, 2, 3, 4, 5 and again 5% of the area and together would produce more." Also, a combination of niche varieties is less likely to break down than a single variety, which is more susceptible to being wiped out by one kind of disease or pest.

Adoption potential: participatory versus formal format



This lesson was taken to heart at ISAR, where the rate of varietal release had gone way up before the bloodshed began early in 1994. In the last three years, breeders have released some 10 bean varieties, compared with one variety every two years before the whole process of farmer participation began in the mid-1980s. "ISAR is proud that they've released more varieties than just about anybody else," says Kornegay of CIAT. "It's been an education and a learning process, but now any researcher would be able to tell you why they should release more varieties."

Moreover, she says, the national program became very aware of the need to include women. "It wasn't necessarily so in the mid-80s. But they are definitely aware of the importance of working with farmers, and of course, women are the farmers when it comes to most food crops."

CIAT stresses the need for a team approach if farmers are to be more integrated into formal research. "You need specialists in anthropology or farm sociology or rural economics, and they're responsible for selecting the farmers and making the system work," says Pachico. "To really make it work, you have to have that multidisciplinary capacity in the national program."

The decision to recruit and train specialists in the social sciences appears in ISAR's long-term action plans. But actual hiring has been slow. Certainly, after the civil war started in 1990, government money was directed towards more immediate concerns.

BROADENING THE GENETIC VARIABILITY

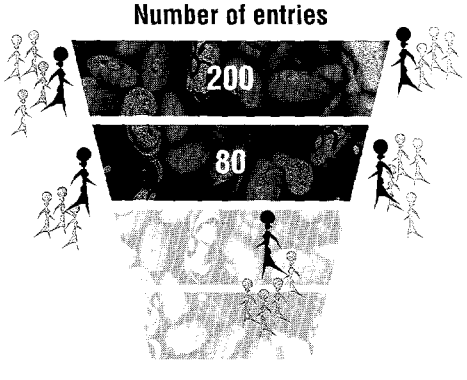
In 1990, CIAT and ISAR expanded the farmer participation experiment, exploring specific themes in several directions in their second phase of testing this model.

Researchers wondered whether farmers could be brought on-station a stage earlier, say five to seven seasons before normal on-farm testing. This implied they would be screening many, many more lines. Was there a limit on what farmers could handle? How many varieties might be "too much"?

The working hypothesis was that casting a wider net even earlier would speed up the selection process, eliminating the "trash" while pushing out promising varieties more quickly. It also might help identify a larger number of acceptable varieties, without higher costs. Encouraging greater genetic diversity in the farmers' fields was also a prime goal.

Participatory selection format, phase 2

Farmer experts evaluate on-station trials 5-7 seasons before normal on-farm testing. Women, representing 5 farmer groups, select a large set of varieties for testing on community plots.



Again, there was resistance from some breeders who believed farmers incapable of sorting through a large pool and who were leery of letting the varieties go before possible weaknesses had been detected. As a compromise, the team asked Robin Buruchara, CIAT team pathologist, to do a special screening of the yield trials and throw out the entries highly susceptible to disease. So, in the comparative trial of February 1991, 20 of the 80 cultivars were eliminated. Says Sperling, "If you are going to have farmers screen technologies early, screening what amounts to prototypes, researchers have to make special efforts to minimize the risks—anticipate what the farmer can't."

Scheidegger tried to foresee the administration's possible reluctance by shaping the program in the form of a controlled experiment with a scientific check. "Instead of saying it will work," he recalls, "we said, 'Why don't we look at it as a trial?' We start out with the same 80 lines and we follow their winnowing down through two parallel treatments: one, the conventional selection framework, or the check, the other, the participatory farmer selection program, or the test case."

An impact assessment of this work was scheduled to start in mid-1993, continuing through 1994 and if necessary, early 1995. The two breeding frameworks would be compared according to costs, yields, number of acceptable varieties identified, disease incidence and adoption rates. While the war in Rwanda has torpedoed these plans, some preliminary data should help CIAT determine whether the system was starting to work.

At a regional community trial. Urs Scheidegger with the local councillor. Such local administrators could prove crucial to extending the decentralized selection model countrywide.

DECENTRALIZING AND DEVOLVING TESTING

To broaden the program on the farmers' plots, researchers had two concerns: how to encourage communities to select their own expert representatives and how to shift much of the on-farm testing to the communities themselves, where it belongs.

Sperling believes that shifting primary responsibility for on-farm testing to the farmers represents "a healthy mix of empowerment and cost-savings." Communities should have the right to select their own delegates to screen on-station. And communities should control how their 20 or 25 chosen varieties are tested in rural areas.

In addition, only when communities plant and manage the trials themselves can such a selection program be widely decentralized, targeting germplasm for many different areas. "That is the only way to make the program cost effective," says Sperling, "because intensive on-farm research costs money, and widespread testing by researchers can cost even more."

From March 1990 onwards, women experts coming to station represented the interests of five specific cooperating groups: a women's

Zairian women's group with whom ISAR and CIAT directly do research.

cooperative backed by COOPIBO, a Belgian non-governmental organization (NGO); a self-organized, independent group of research-oriented farmers; and three separate groups of farmers representing their administrative units or "communes".

The cultivars women selected were managed in various types of community plots, some serving up to 6,000 households. Some 40 to 50 farmers were invited to review each community plot. In the first two seasons alone, participants selected 26 varieties for home testing.

Some scientists protested that they were being pushed to the edge of biological research, moving towards extension, beyond their brief. But others saw clearly the strenuous, scientific research needed to institutionalize this kind of program. In 1991, the Great Lakes Breeding Strategies Workshop, dominated by Rwandan, Burundian and Zairian breeders, formally recommended that research on community-level selection be pursued.

PROGRAM INSTITUTIONALIZATION: RESULTS AND CHALLENGES

Rwanda's hierarchical structure, with its strict superior-subordinate relationships, permeates agricultural research and evaluation, as well as everything else. Farmers are strictly monitored, even on their private field plots. For instance, rules have it that coffee, a key export, is not be intercropped, no matter that a few beans here or there would make no difference to the coffee crop. Rwanda's hierarchy, a basically male hierarchy, shaped the expansion of the participatory experiment.

The traditional biases were evident from the beginning of station selection, says Sperling. "We had the sense that some of the so-called community-selected experts were neither very informed nor very representative of community interests. We had the government agronomist's sister, the sector head's wife. The authorities in charge, men, linked power with knowledge, and imputed male knowledge to his female sidekick. So if he was an important official, she must be a farmer expert."

Sperling also believes that the commune authorities in charge sometimes fell short on their obligations to community participants. The community plot was laid, evaluations completed and the grains harvested, but seed of selected varieties was never distributed to individual farmers. "We tried to devolve it too quickly," concludes Sperling. "We were too optimistic about the prospects of more grassroots initiatives."

The experiment did thrive when women themselves had some control and when the community saw itself as a true community. The women's cooperative, within the Projet Agricole de Muganza, was well organized and very serious about the research. Five experts were sent to the research station, and varieties they chose were later tested on designated group members' plots. The cooperative as a whole agreed what to multiply, what to discard and what to test further. More than a ton of seed was multiplied before other communities had started to budge.

"It's a conceptual leap, linking true cost-effective breeding with changes in the power base," says Sperling. "We have evidence that a decentralized community-based selection program can work technically. But to succeed, perhaps communities, including women, need to feel that the research process is theirs, for them. Ownership is potent."

EXPANDING HORIZONS

Kornegay, head of CIAT's Bean Program, believes farmers should make regular visits to the research station, and could evaluate varieties even earlier than has been tried up to now. "There's a lot of controversy about this, but I think they can start seeing materials just as soon as they become pure lines."

Davis, now working for a commercial seed company, believes the method shouldn't be limited to subsistence farmers. "I think it's

applicable to virtually any situation. I would say it's just getting closer to your client, isn't it? And in any situation it has to end up producing better results."

The national agricultural research program of Zaire has taken up farmer screening of bean varieties with enthusiasm, launching programs at four sites in North and South Kivu. Farmer screening on-station is also being pursued at Tanzania's Sokoine University of Agriculture, which sent three researchers to visit the Rwandan project before embarking on their own locally-adapted research variations. In the Tanzanian lowlands, a team of scientists and farmers are evaluating more than 200 lines of early generation bean materials both on-station and on-farm. And, because about half the farmers and half the scientists are women, the researchers plan to disaggregate the data by gender, to see whether there are differences in how the men and women view the plant, the seed and consumer characteristics.

In some cases inspired by the Rwandan work, but pushing forward in their own novel directions, other centers in the CGIAR are looking at the role of farmers, who are often women, in making their own breeding processes more efficient and effective.

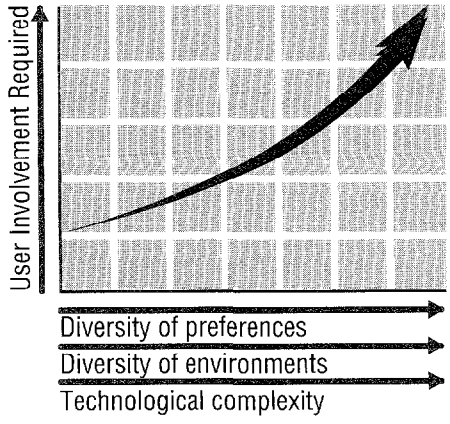
At the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), researchers are involving farmers in Rajasthan, India in the breeding process of pearl millet, a more complex, cross-pollinated crop. "Our main goal was to understand better which traits farmers really want in a new variety so that we can tailor the breeding program properly, and not work on things that are non-adoptable right from the start," says breeder Eva Weltzien Rattunde. Now in the third year of on-farm trials, 40 farmers representing community organizations came to the research station to help select varieties for home testing. "It's just incredible how much information we are getting in such a short time by just talking to farmers, by involving them and being open. It's not only enriching to the breeding work but to anyone else involved, the agronomy work and so on," says Rattunde.

At the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria, Salvatore Ceccarelli, a barley breeder, asked farmers to select the best material from up to 2,000 breeding lines grown in their own fields, to learn which complex of traits makes a barley crop attractive to them. Three lines identified through these informal contacts with farmers have been distributed and continue to spread from farmer to farmer, though, adds Ceccarelli, "Interestingly enough, only one of them has been (formally) released."

Meanwhile, there are those who believe farmer participation research can be even more important in finding solutions to agricultural problems that don't depend on genetic improvement of crop varieties. "I think the principles have even greater potential when you move to more complex problems, like crop rotations or the introduction of agroforestry species," says Pachico of CIAT. "The more complex the system becomes and the more complex the management requirements are, the more you need farmer input at an earlier stage. There are so many variables that it's that much harder for the researcher to get his brain around it."

Sperling says, "There are three contexts where farmer participation appears to be vital: when clients have a great diversity of preferences; where farming environments are varied; and where technology is particularly complicated.

Achieving Impact



In the first two instances, if you leave farmers out, you might miss certain groups of clients. In the case of complex technologies, whether or not you involve clients can determine your success or failure."

CIAT teams in other African countries are trying to refine methods to work with farmers on many different technologies: in Kenya, on associating climbing beans and maize; in Tanzania, on pest management; in Uganda, on managing plant diseases and enhancing soil fertility.

In many cases, new methods are being tried because the old methods didn't work. "Some of this technology may have been recommended for 20 years but has never been adopted," says Kirkby of CIAT, cautioning that the move to more collaboration with farmers is slow work.

In third world agricultural research, getting people to listen to the customer isn't easy; getting people to work with the customer is even harder. But the results speak for themselves.

EPILOGUE

AUGUST 1994: THE WAR

Everything has changed since a plane was shot down in Rwanda's capital Kigali on April 6, 1994, leaving among the dead the presidents of Rwanda and neighboring Burundi, who had been involved in talks to end the three-year war in Rwanda. The brutal bloodshed that spread to the countryside has left hundreds of thousands of people dead, millions in refugee camps in bordering countries and thousands more in camps controlled either by mainly Hutu government troops or the mainly Tutsi Rwandan Patriotic Front.

Vast areas of the countryside have been abandoned, crops lie rotting in the fields and it seems impossible that seeds will have been planted this fall, one of the two main growing seasons. In the south of the country, ISAR's research station at Rubona was overrun by troops loyal to the former government. The work of the national agricultural research system has ceased. Many staff are dead, including key figures in this participatory selection experiment.

The famine which threatens millions of Rwandan families will hurt not only this but future generations—farmers may be forced to eat their seeds, wiping out hundreds of unique bean varieties.

The CGIAR has joined together with national agricultural research systems in Central and Eastern Africa, launching a crash program to multiply valued local varieties as well as the most popular of improved cultivars. Taking the lead in beans, CIAT and the African bean networks are multiplying some 200 tons of seeds, representing 285 varieties previously found on Rwandan farms. The seeds are to plant, with the dual hopes of restoring local food production and the genetic diversity of beans.

Distributing food aid in midst of such a societal breakdown is hard under any circumstances. Seed distribution is still more challenging in that farmers need to be urged to plant what they more immediately need to eat. Development agencies, including NGOs, will forge the critical link to farmers, distributing different "genetic strips" to farmers in different agroecological zones. Packaged into kilogram packages, the seed strips will contain five varieties each. "In the midst of all the other challenges, the right seeds have to get on the right truck," says Wayne Youngquist, current coordinator of the Great Lakes Bean Network. Aid efforts are clearly going beyond what has been tried before: during the 1993 famine, just two bean varieties were distributed in Rwanda, one for high and one for low altitude.

Other countries in the region, including Tanzania, Uganda, Zaire and Burundi are cooperating in the seed relief effort. Many varieties are being multiplied in Uganda, Tanzania and Malawi, with those countries offering fields as well as technical assistance. Burundi and Zaire gave from their own germplasm stocks. When asked whether Uganda would help, the director of agricultural research, Joseph Mukiibi, replied that when the Ugandan war ended, the country's first varieties came from Rwanda. "The least we can do is return the favor," he said.

Many players in these countries' national research programs already know each other as colleagues through the regional bean network established a decade ago. "We're looking at the Rwanda seed relief initiative as a regional effort and hope that valuable experience will be learned in the region about how to deal with future crises of this sort," says Kornegay. "So if another country has an emergency or a drought hits, we'll learn how the region can help itself to reproduce seed."

As for Rwandan farmers, years of collaborating with them has taught researchers the principles which make the seed relief efforts possible. Germplasm needs to be targeted to specific agriculture zones; multiple varieties encourage stable and reliable production; and skilled farmers need options with which to shape a productive future. Given the correct tools—appropriate genetic material being but one key—skilled Rwandan farmers, women and men, will start the rebuilding of their agricultural economy.

ENDNOTE

This particular publication was started but one week before the Rwandan civil war intensified, in April 1994. It is unfortunate that most Rwandan colleagues who helped make this experiment evolve could not be interviewed. Those abroad were contacted.

SOURCES

CIAT. 1988, 1990 and 1991. Annual Reports.

CIAT. 1990 and 1992. Bean Program Annual Reports.

Graf, W., J. Voss, and P. Nyabyenda. 1991. Climbing bean introduction in Rwanda. In, R. Tripp, ed., Planned change in farming systems: progress in on-farm research. London: John Wiley & Sons.

Jefremovas, V. 1991. Loose women, virtuous wives and timid virgins: gender and control of resources in Rwanda. Canadian Journal of African Studies 3:378-395.

Scheidegger, U., L. Sperling, L. Camacho, P. Nyabyenda, G. Gasana and R. Buruchara. 1991. La participation des paysannes dans la sélection variétale. In, Actes du sixième seminaire régional sur l'amelioration du haricot dans la région des Grands Lacs.

Sperling, L. 1992. Farmer participation and the development of bean varieties in Rwanda. In, J.L. Moock and R. Rhoades, eds. Diversity, farmer knowledge and sustainability. Ithaca and London: Cornell University Press.

Sperling, L. and B. Ntabomvura. 1994. Integrating farmer experts into on-station research. In, H.S. Feldstein and J. Jiggins, eds. Tools for the Field: methodologies handbook for gender analysis in agriculture. West Hartford, CT: Kumarian Press.

Sperling, L. and S. Munyaneza. In press. Intensifying production among smallholder farmers: the impact of improved climbing beans in Rwanda. CIAT African Workshop Series.

Sperling, L., M.E. Loevinsohn and B. Ntabomvura. 1993. Rethinking the farmer's role in plant breeding: local bean experts and on-station selection in Rwanda. Experimental Agriculture 29:509-519.

Voss, J. 1992. Conserving and increasing on-farm genetic diversity: farmer management of varietal bean mixtures in Central Africa. In, J.L. Moock and R.E. Rhoades, eds. Diversity, farmer knowledge and sustainability. Ithaca: Cornell University Press.

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